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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/663,285	09/16/2003	David Bradley	YOR920030058-US1	3227

7590 08/30/2006

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EXAMINER	
RAHMAN, FAHMIDA	

ART UNIT	PAPER NUMBER
2116	

DATE MAILED: 08/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/663,285	BRADLEY ET AL.	
	Examiner	Art Unit	
	Fahmida Rahman	2116	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 June 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-9 and 11-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 3-9 and 11-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 September 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. This final action is in response to communications filed on 6/20/2006.

2. Claims 1, 3-4, 6, 9, 12, 18 have been amended. Claims 2 and 10 have been cancelled. Thus, claims 1, 3-9, 11-20 are pending.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1, 9, 12 and 18 of pending application are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-47 of copending Application No. 10/306301. Although the conflicting claims are not identical, they are not patentably distinct from each other because both the applications discuss

the method for managing workload with plurality of resources, determining total number of active or available servers, determining total number of inactive servers.

For claim 1 of the pending application, the active and inactive powered on servers of claim 5 of co-pending application can be considered as available resources of the claim 1 of pending applications, whereas the active servers of claim 5 of the co-pending application are needed resources of the claim 1 of pending application. The limitation of "calculating number of needed resources required to support the current workload" of claim 1 of pending application is inherent in the co-pending application, since the active servers of co-pending applications represents the needed resources in the pending application. The limitation of "a provision for setting a minimum number of powered on inactive servers" of claim 5 of co-pending application sets the limitation of migrating workload from one resource to another resource as required in claim 1 of pending application. The co-pending application does not discuss about virtual machine, as required by claim 1 of pending application. However, applicant's admission of prior art made it clear that virtual machines are used for managing workload. Thus, the claimed invention of pending application is obvious over the claimed invention of co-pending application.

Claims 9, 12 and 18 of pending application disclose the storage medium and the system necessary to implement the method disclosed in claim 1. Thus, they are rejected for similar reason as stated above for claim 1.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Drawings

3. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated.

See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 12, 15, 16, 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admission of prior art, in view of Fung (US Patent Application Publication 20020004912).

For claims 12, AAPA teaches that the following limitations exist in prior art:

A processing workload management system comprising:

- **multiple physical resources capable of supporting one or more virtual machines** (Fig 1); **and**
- **at least one power management component** ([0003] mentions that resources can be placed into low-power state to conserve energy. Therefore, power management component exists to save power) **adapted to calculate the number of needed resources** ("a smaller number of resources" as mentioned in [0003]) **required to support the current workload** ("workload" in [0003]) **based on the total utilization of the resources currently powered on** (workload can be aggregated when resources are underutilized as mentioned in [0003]. Therefore, aggregation to smaller number of resources is based on utilization of the resources);
- **ascertain the number of the available resources within said system** (the larger number of resources is the available resources);
- **determine the relationship between the number of needed resources and the number of available resources** (when workload is aggregated to smaller number of resources from larger number of resources, the relationship between

available and needed resource is that the available resources are greater than needed resources);

- **and perform steps to migrate at least one virtual machine from at least one physical resource to at least one other physical resource based on the relationship** (VM migration is mentioned in [0018], which is the description of Fig 1, the load balanced according to prior art).

Although applicant mentioned about "load imbalancing" and "load balancing" in the background of invention as prior art approaches, there is no indication that the Prior Art technique shown in Fig 1 employs the "load imbalancing" discussed as prior art approaches in [0003].

It would have been obvious for an ordinary skill in the art at the time the invention was made to combine the prior art of Fig 1 with the prior art "load imbalancing" teaching of [0003] of page 1. One ordinary skill in the art would have been motivated to incorporate the load imbalancing feature in the system shown in Fig 1 to conserve energy as mentioned in lines 8-16 of [0003] of page 1.

Although the applicant's admission of prior admits the limitations of claim 1 such as calculation of needed resources required to support workload based on total utilization of the resources currently powered on and determining the relationship between the number of needed resources and the number of available resources, the AAPA does not explicitly describe how to perform such operations.

Fung discloses a dynamic workload management for multi-server environment (abstract), where tasks performed by one node may be shifted to one or more other nodes that have additional capacity and the former node can be powered down ([0049] of page 5). The system calculates the needed resources (as [0066] of page 7 mentions that only those resources that are actually needed to provide the quality are in the active mode), available resources ([0066] mentions that the not needed resources may be powered off. Thus, the number of not needed resources has to be determined. Therefore, the number of all available resources and needed resources are counted) and powered down the resources that are not needed. Thus the system of Fung calculates the needed and available resources, powered down the not needed resources, migrate workload to other resources ([0066]) that requires determining relationship between needed and available resources, as required by claim 1 of the pending applications.

It would have been obvious to one ordinary skill in the art at the time the invention was made to combine the teachings of AAPA and Fung. One ordinary skill in the art would have been motivated to take the steps to implement the method of AAPA, since that would ensure the quality and implementation details of the system as mentioned in Fung.

For claims 15 and 16, note lines 18-19 of [0160] of page 17 of Fung, which mention that the servers can manage power by itself as well as global master.

For claims 18, the cited references teach the limitations as stated above in claim 12. The comparator is in the system as the system checks if the resources currently supporting workload are larger than the resources actually needed. This is a requirement of workload aggregation as mentioned in [0003].

4. Claims 1, 3-6, 9, 11, 13-14, 17, 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admission of prior art, in view of Fung (US Patent Application Publication 20020004912), further in view of Pinheiro.

For claim 1, applicant admits that the following limitations exist in prior art:

A method of managing workload on a system (Fig 1) **comprising:**

a plurality of resources (100-103) **each capable of supporting one or more virtual machines** (200-207) **and at least one shared storage location** (400), **comprising the steps of:**

- **calculating the number of needed resources** ("a smaller number of resources" as mentioned in [0003]) **required to support the current workload** ("workload" in [0003]) **based on the total utilization of the resources currently powered on** (workload can be aggregated when resources are underutilized as mentioned in [0003]. Therefore, aggregation to smaller number of resources is based on utilization of the resources);

- **ascertaining the number of the available resources within said system** (the larger number of resources is the available resources);
- **determining the relationship between the number of needed resources and the number of available resources** (when workload is aggregated to smaller number of resources from larger number of resources, the relationship between available and needed resource is that the available resources are greater than needed resources);
- **and performing steps to migrate at least one virtual machine from at least one physical resource to at least one other physical resource based on the relationship** (VM migration is mentioned in [0018], which is the description of Fig 1, the load balanced according to prior art).
- **Wherein said performing comprises instructing at least one VM to migrate from its respective one of said plurality of available resources** ([0018] is the description of Fig 1, which is in accordance with the prior art. [0018] mentions that VMs to migrate to different server) **by halting processing at its respective one of said plurality of available resources, copying its entire state to said storage location, and resuming processing in at least one different resource of said plurality of available resources** (migration of VM requires halting of processing, copying state to a storage and then resuming processing as explained in page 12 of remarks. Besides, servers are connected to each other through 400 as shown in Fig 1 of applicant's disclosure. Therefore, migration should be through 400, which requires copying entire state to 400).

Although applicant mentioned about "load imbalancing" and "load balancing" in the background of invention as prior art approaches, there is no indication that the Prior Art technique shown in Fig 1 employs the "load imbalancing" discussed as prior art approaches in [0003].

It would have been obvious for an ordinary skill in the art at the time the invention was made to combine the prior art of Fig 1 with the prior art "load imbalancing" teaching of [0003] of page 1. One ordinary skill in the art would have been motivated to incorporate the load imbalancing feature in the system shown in Fig 1 to conserve energy as mentioned in lines 8-16 of [0003] of page 1.

Although the applicant's admission of prior admits the limitations of claim 1 such as calculation of needed resources required to support workload based on total utilization of the resources currently powered on and determining the relationship between the number of needed resources and the number of available resources, the AAPA does not explicitly describe how to perform such operations.

Fung discloses a dynamic workload management for multi-server environment (abstract), where tasks performed by one node may be shifted to one or more other nodes that have additional capacity and the former node can be powered down ([0049] of page 5). The system calculates the needed resources (as [0066] of page 7 mentions that only those resources that are actually needed to provide the quality are in the active

mode), available resources ([0066] mentions that the not needed resources may be powered off. Thus, the number of not needed resources has to be determined. Therefore, the number of all available resources and needed resources are counted) and powered down the resources that are not needed. Thus the system of Fung calculates the needed and available resources, powered down the not needed resources, migrate workload to other resources ([0066]) that requires determining relationship between needed and available resources, as required by claim 1 of the pending applications.

It would have been obvious to one ordinary skill in the art at the time the invention was made to combine the teachings of AAPA and Fung. One ordinary skill in the art would have been motivated to take the steps to implement the method of AAPA, since that would ensure the quality of the system as mentioned in Fung. Pinheiro also explains the load imbalancing can contribute significantly to save power.

For claims 3 and 4, applicant's admission of prior art discloses that the resources can be powered off or powered on as workload ebbs and flows. The powering down is only possible when some resources are loaded off by removing workload from them. Migration of workload is only possible when available resource exceeds the needed resource. If workload increases, resources needs to added or powered on that was powered off when load was light.

For claims 5 and 6, [0017] mentions that the height of each VM indicates the amount of resources it consumes on that machine. Thus, the system determines the utilization amount for each of the resources. Since load imbalancing aggregates workload and increases utilization of the resources to which the workload is migrated, the needed resource is calculated by additing the utilization amounts.

Claim 9 discloses the device storing instructions for executing the method disclosed in claim 1. In order to execute the method, the instructions to perform the method must be stored within a storage device. Thus, the cited references that teach claim 1 also teach claim 9.

Claim 11 discloses the device storing instructions for executing the method disclosed in claims 2-3. In order to execute the method, the instructions to perform the method must be stored within a storage device. Thus, the cited references that teach claims 2-3 also teach claims 10-11.

For claims 13-14 and 19-20, AAPA teaches the migration and powering down of resources. Migration requires halting of processing in the resource, copying state to storage 400 and resume processing in the new resource.

For claim 17, the nodes can be on and off by the system any time. Thus, the powered down node can be powered up by the system any time.

5. Claims 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over applicant's admission of prior art, in view of Fung, further in view of Pinheiro et al., further in view of ordinary skill in the art.

The combination teachings of AAPA, Pinheiro et al do not teach that the needed resources required to support the given workload is determined to be the smallest integer number larger than the total utilization.

It would have been obvious for one ordinary skill in the art to modify the teachings of AAPA, modified by Pinheiro, to have the needed resource to be the smallest integer number larger than the total utilization, since that would ensure the optimal performance of the system where least amount of resource can guarantee the full support of workload.

Response to Arguments

Applicant's arguments filed on 6/20/2006 have been fully considered but they are not persuasive.

AAPA argues that instructing VM to migrate to another resource is not known in prior art as applicant's specification expressly taught that no prior mechanism existed for

balancing workload and managing power that require state be maintained, and no mechanism existed for VM. Therefore AAPA does not teach the claim features.

Examiner disagrees. [0017] and lines 1-14 of [0018] are the description of Fig 1, which is mentioned as prior art in [0010]. [0018] mentions that VM may be migrated to a different server. Although background specifically mention that no prior mechanism existed for balancing workload and managing power that require state be maintained, and no mechanism existed for VM, Fig 1 and it's corresponding description clearly mention that VM may be migrated to different server. Fig 1 is described as a virtual machine configuration with load balanced in accordance with the prior art in [0010]. Applicant needs to provide a satisfactory explanation why prior art associated with Fig 1 provides the teachings that are denied in background. There is no such explanation in the remarks or anywhere although examiner made the rejection based on Fig 1 in the first action.

Applicant argues that AAPA does not teach the number of resources (needed or available).

Examiner disagrees. [0003] mentions that workload can be aggregated from a large number of resources to a smaller number of resources. Large number of resources is the number of available resources as it is supporting the workload now. The small

number of resources is the needed resource as it can sufficiently support workload after aggregation.

Applicant argues that Fung does not teach steps for managing a workload and power in a system wherein VMs are operating. Although Fung does not teach migration of VM, the AAPA described migration of VM in [0018]. Fung teaches the workload and power management, which may provides the implementation details of [0003] of AAPA.

Applicant further argues that Pinheiro does not provide missing parts from AAPA and Fung. Thus, the combination does not teach the invention.

Examiner disagrees. The combination of AAPA and Fung teaches all the limitations of claimed invention. Pinheiro provides enough motivation and supporting features of the claimed invention to make it obvious to one ordinary skill in the art.

Conclusion

Below is the listing of prior art made of record but not relied upon:

Oyamada et al (US patent 6802062) teach a system where VMs are migrated from one resource to another.

Traut et al (US Patent Application Publication 20040010787) teach a system where multiple resources are capable of supporting VMs and VMs are migrated from one resource to another resource. The system also calculates the needed resource to support workload based on utilization, ascertains the available resources to migrate the VM from one host to another host ([0007]-[0008]).

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fahmida Rahman whose telephone number is 571-272-8159. The examiner can normally be reached on Monday through Friday 8:30 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne Browne can be reached on 571-272-3670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Fahmida Rahman
Examiner
Art Unit 2116

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